DATA TECHnology, inc.

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GUIDELINES TO SPECIFYING A COUNTER

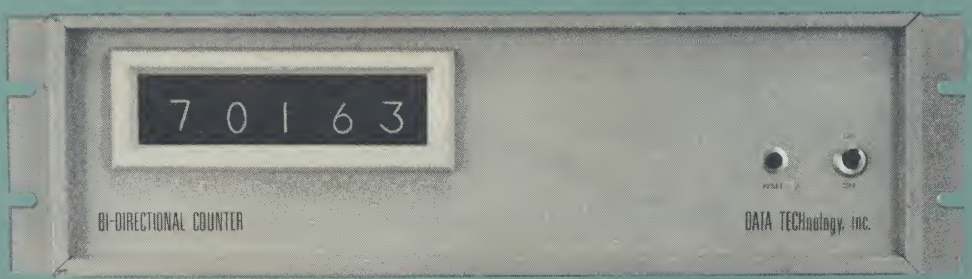
A Building Block Approach to Counter Design and Specification

COUNTERS — GENERAL

In its simplest form, a counter accepts an electrical input comprised of a series of pulses or level changes, counts these to obtain a cumulative total, and provides the accumulated number as an electrical output, a visual display, or both. Even in this simple form the number of design variables is considerable: the number base used, the total count capacity, the counting rate, the form of input accepted, and the type of display or electrical readout provided. In addition, a large number of auxiliary features exist which enable the simple counter to perform very specialized functions, e.g., X-Y position readout for incremental encoders, frequency measurements, velocity or rate measurements, and many applications involving balancing or null indication.

SOURCES OF ASSISTANCE

DATA TECHnology, inc. applies a wealth of accumulated experience in suggesting appropriate counter techniques and equipment. From this experience a modular approach has been devised, which allows the customer virtually to "design" his own counter — one that will be tailored to his requirements and contain all the desired auxiliary features. This approach can, in most instances, be implemented entirely with standard logic modules and cabinets. The result is customized equipment with prices and delivery schedules practically on an "off the shelf" basis.



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HOW TO TAILOR A COUNTER TO YOUR APPLICATION

The Block Diagram represents a "Generalized Counter", containing all of the standard options presently offered by DATA TECH. It is intended to suggest the range of possibilities but by no means to limit the choice. DATA TECH applications engineers welcome inquiries for any non-standard feature desired.

The block diagram depicts the flow of information beginning with a signal to be counted and ending with a number of standard output options as well as an integral or projected numerical readout display. As many as eight counting stages per axis may be included in standard units. All other function blocks represent optional features. The diagram represents one counting axis; standard counters may contain one, two, or three axes.

The designation of a feature as a standard option and the designation of its price are premised on the possibility of the required logic being housed in the counter cabinet. A number of options may be accommodated on this basis. If the total requirement (including basic number of decades as well as number of options) becomes sufficiently large, one or more additional cabinets may be required. In such cases additional packaging costs and interfacing problems would demand that the requirement be treated as a customized system and priced accordingly. This folder contains helpful information to assist the engineer in selecting the maximum combination of decades and options possible within the standard counter cabinet. Each counting decade requires one logic card (per axis). Each option block indicates the number of cards required to implement . . . sometimes as a multiple of N. Once the card requirement is determined it may be compared with the card capacities afforded by single, double or triple bay cabinets (refer to rear flap of this folder).

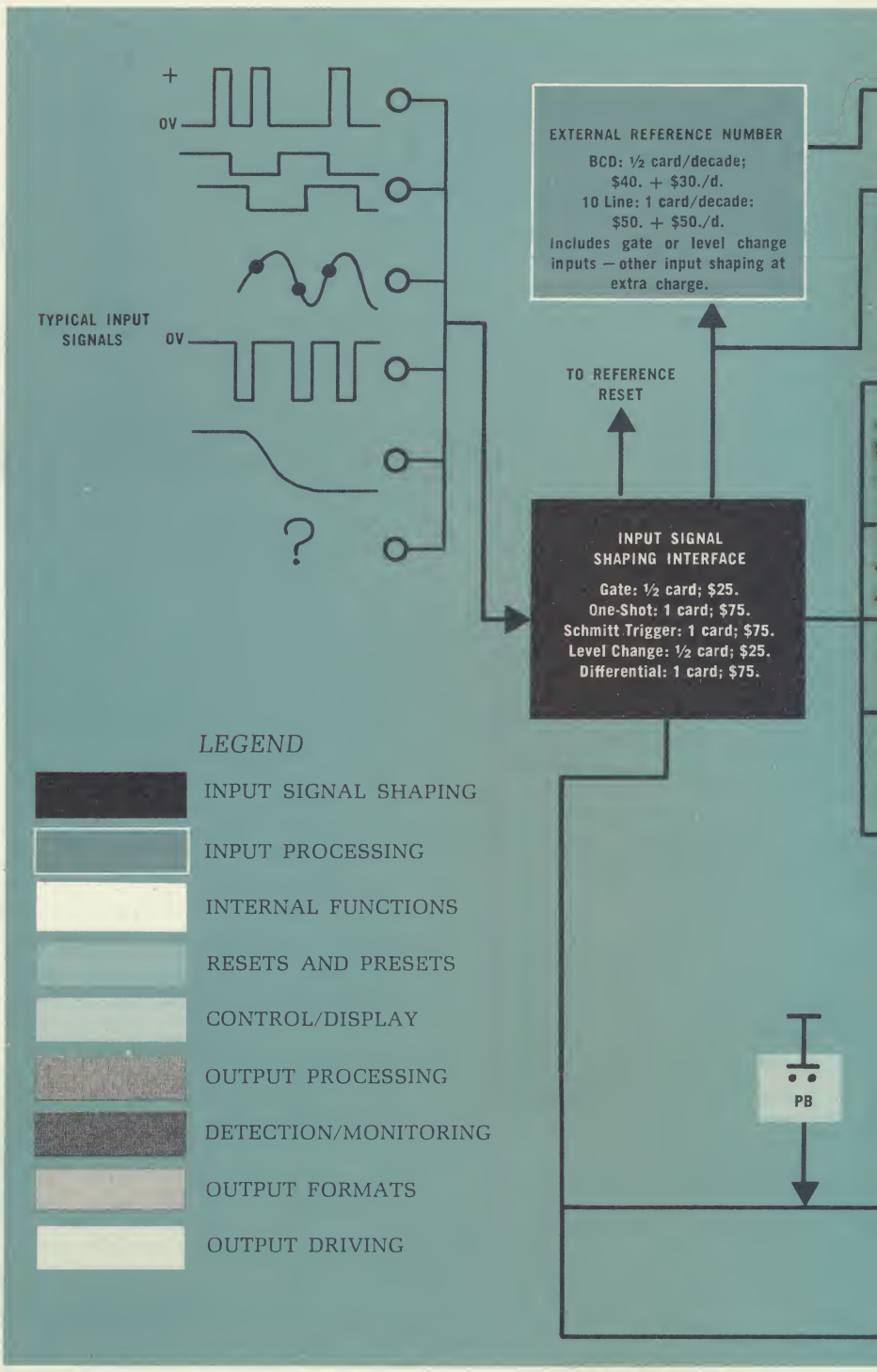
THE DATA TECH MODULAR SYSTEM — ADVANTAGES TO USER

Three benefits, in addition to flexibility, are derived from DATA TECH's modular approach.

■ *Ease of Maintenance.* In the event of a malfunction, it is merely necessary to replace a plug-in logic card. The user can readily locate the defective card by listing the symptoms, since there is a one-for-one relationship between functions and logic cards in most instances. DATA TECH has devised a Symptom Check List to facilitate this approach. All logic cards are standard items and may be supplied within a few days ARO. Customers who have especially critical requirements are provided with a recommended spare-card-list — so that downtime in event of failure may be counted in minutes, not days.

■ *Ease of Modification.* The second major benefit of the modular construction is the ease with which modifications may be made subsequent to purchase. Units may be returned to the factory to have additional decades or options added with a minimum of expense and delay.

■ *Improvements in Circuitry.* A third and final benefit derives from improvements in circuitry which are made from time to time, resulting in improved logic cards. Customers can take advantage of these improvements by replacing specific cards in the field — with no loss of operating time or expense beyond the card price itself.



DETAILS OF KEY OPTIONS

INPUT SIGNAL SHAPING . . .

accepts a virtually unlimited variety of input signals. Options include simple gating for square wave or standard pulse inputs; one-shots for standardizing pulse waveforms; and Schmitt triggers for use with sinusoidal or irregular signals. Inputs may be set for positive levels, negative levels, high signal voltages, or low levels, as required. Some of the more common configurations are indicated in the Block Diagram. For a more complete discussion of interfacing possibilities, write for the descriptive bulletin, "Guidelines to Interfacing Capability".

REFERENCE NUMBER INPUT . . .

implements entry of multi-digit numbers from other system components . . . useful for presetting counters or for range detection comparisons. Numbers may typically enter on parallel lines to simple gate inputs in a BCD, 10-line, or other code. A very considerable range of input formats is possible, however — includin serial shift register input, any desired level special codes, etc. For a more complete di cussion of these input possibilities, write f descriptive bulletin, "Guidelines to Interfacin Capability".

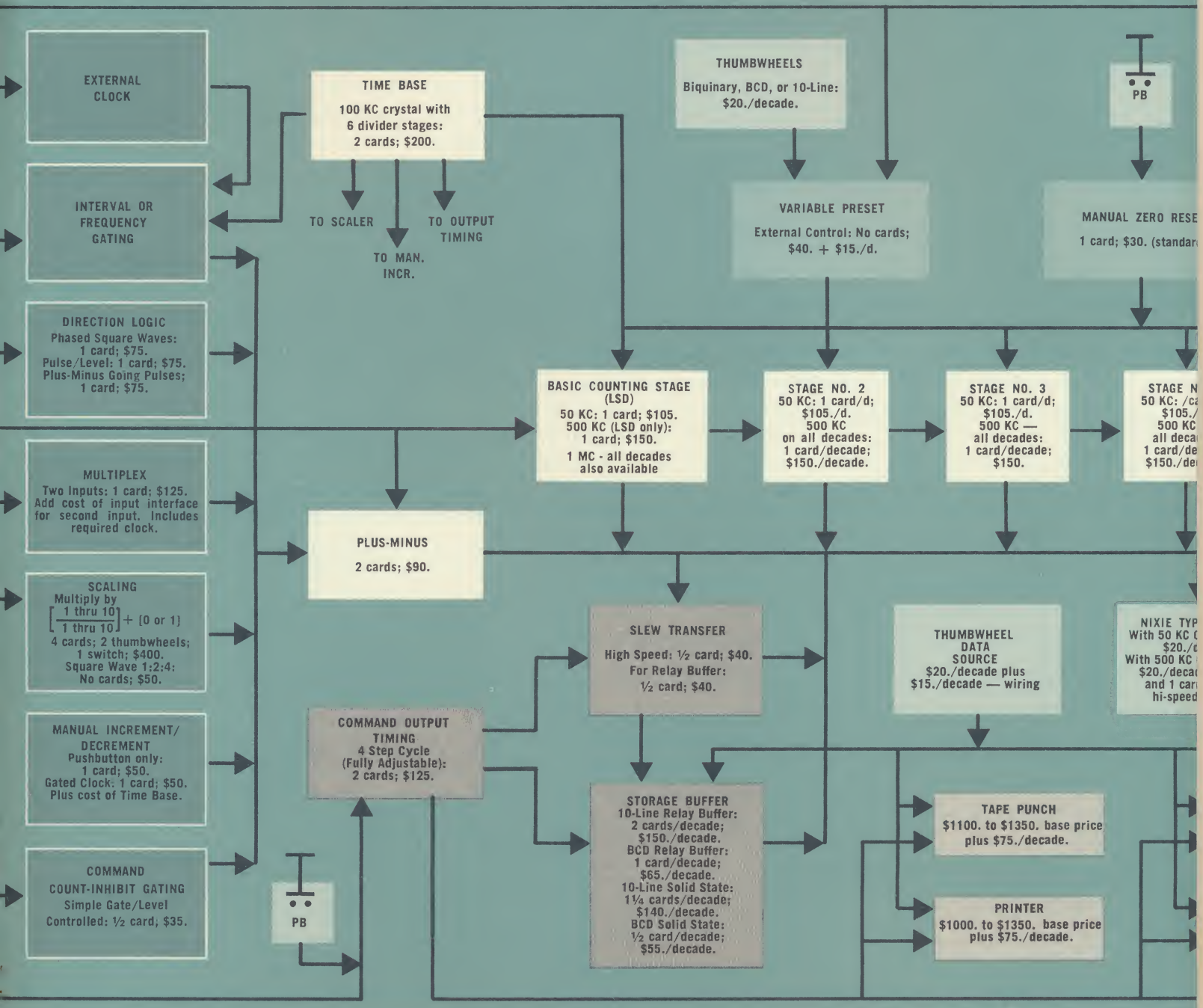
INTERVAL/FREQUENCY . . .

using calibrated time base and count puls gating, allows the counter to measure eith the frequency or the period of an input wav form. In the frequency mode the counter a cepts signal pulses for a clock-controlled tim interval, displays the answer for an adjustab hold period or until triggered, then resets an repeats the cycle. In the interval mode tw successive pulses of the input signal are use to start and stop a gating interval during whic clock pulses are counted. The crystal-controlle time base can supply a clock signal from .1 cp to 100 KC. This range may be further extende at either end, at additional cost.

SCALING . . .

is available in many forms. Fixed downwa scaling in any binary or decimal multiple

DIAGRAM OF GENERALIZED COUNT



readily implemented by the insertion of input flip-flops or dummy counting stages. An alternative and completely adjustable form uses a counter overflow principle with one or more thumbwheel digits controlling the overflow point. This may provide variable scaling from .01 to 1.99.

When square wave input signals are used, scaling by 1, 2, or 4 can be economically arranged at no additional cost.

MANUAL SLEW OR INCREMENT . . .

with pushbutton control on the front panel, allows for manually increasing or decreasing the accumulated answer. Count pulses may be introduced one at a time, or gated-in from a controlled oscillator integral to the counter. This feature is useful in making small corrections or adjustments as for position readout or for rapidly approaching a desired number range.

PLUS-MINUS COUNTING . . .

offered in bi-directional counters, extends range to negative numbers. Thus, a down-counting pulse changes a previous reading of 000 to —001, etc. (Counters lacking this feature would proceed to all nines.) The algebraic sign of the answer may be displayed and/or provided in electrical output.

BASIC COUNTER STAGE . . .

capable of either unidirectional or bidirectional counting, may be base 8, 10, or 16. Either a 50 KC or 1 MC count rate may be specified. Standard counters contain up to eight stages per axis. The 50 KC decimal stage is implemented by a flip-flop and a five-stage ring counter and presents a bi-quinary output. The 1 MC counterpart is implemented by four flip-flops and presents BCD output. (A more complete discussion of logic alternatives is on the rear flap of this folder.) Either type requires buffering if outputs are to be brought out of the counter cabinet. Level changing and/or conversion to other formats may be combined with the buffering function without significantly increasing cost (refer to discussion of Output Interfacing).

MODULO RESET . . .

a special reset, needed to implement a modulo which is not an even multiple of the basic counting stage, i.e., other than 10, 100, 1000, for decimal or 8, 64, 512, for octal. For example, in angular measurements, it may be desirable to count up to 359.99 and reset to zero when proceeding clockwise; conversely to count down to zero and reset to 359.99 when proceeding counter-clockwise.

VARIABLE PRESET . . .

permits a desired number to be set in the counting stages in response to a pushbutton on the counter or to a reference pulse input. The number may be determined by thumbwheel digit controls on the counter front panel or by coded information transmitted to the counter from another component in a system (refer to discussion of Reference Number Input Interface). This preset lends itself to cyclic or repetitive operation as in process control, where, for example, a quantity of parts must be counted out in a series of groups or batches.

REFERENCE PULSE RESET . . .

allows a predetermined (fixed) number to be set in the counter in response to a pulse input . . . especially useful in incremental position readout applications wher
produced once per turn b
coder is used to provide
absolute orientation of th

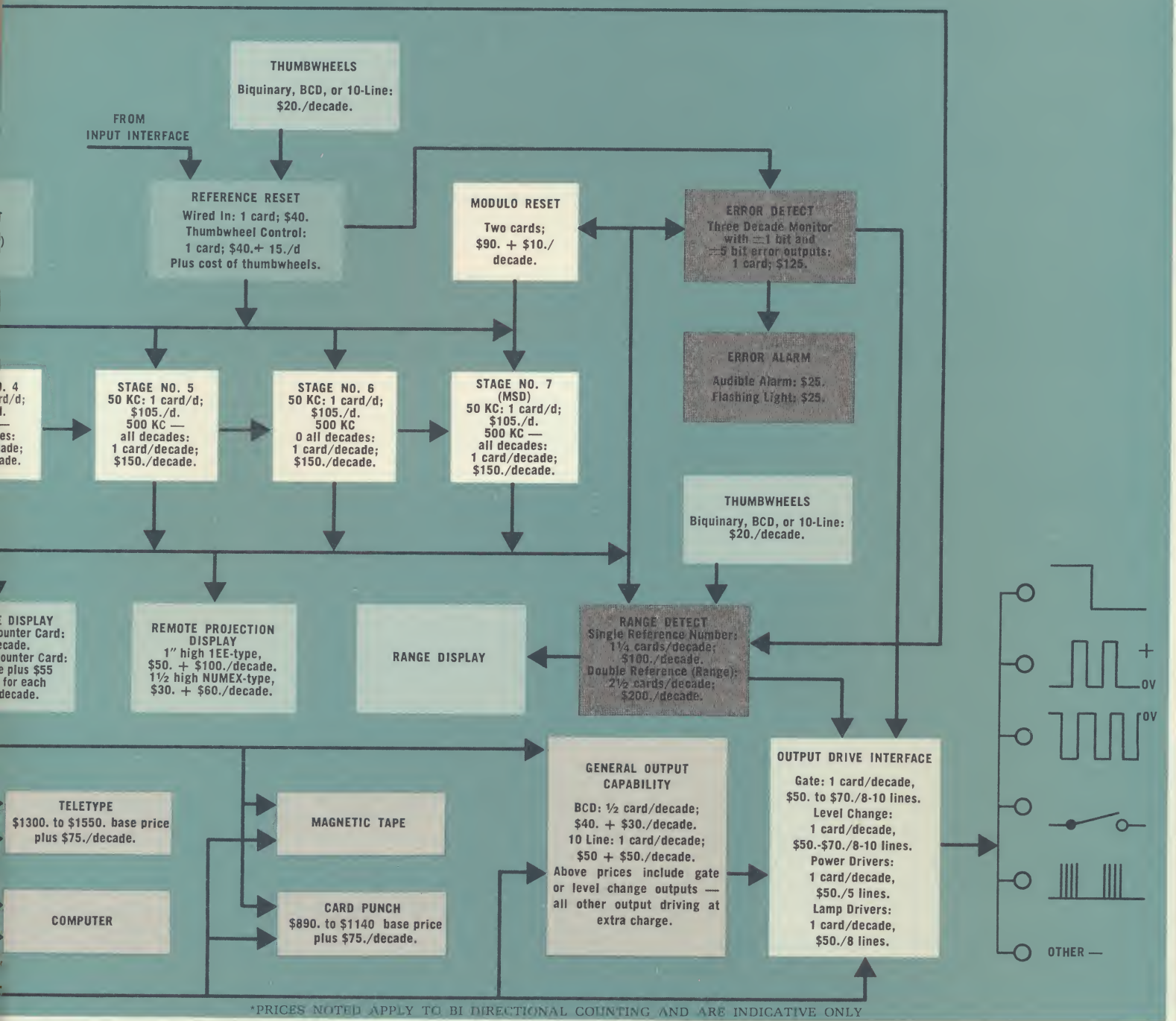
SLEW TRANSFER . .

allows data to be taken
stages while counting is
from counter to buffer
controlled by a timing r
gal numbers (counting tra
transferred. In one form,
transfer to a high-speed
even when the counter is
mum rate (50 KC or 1 MC
used with relay buffers, in
the counter is slewing abo

STORAGE BUFFER .

a memory bank capable
reading on command and
for subsequent presentati
ment. A "Command Input
equipment causes the buf
store a number which is
ing stages. The option an

'ER* (You may choose from any of these options)



*PRICES NOTED APPLY TO BI DIRECTIONAL COUNTING AND ARE INDICATIVE ONLY

a reference pulse
a shaft angle en-
initial and periodic
counter.

from the counting
progress. Transfer
or other device is
odule so that ille-
sitions) will not be
this module allows
buffer or computer
slewing at its maxi-
. An alternate form,
ibits transfers when
e an allowable rate.

f storing a counter
holding the reading
n to external equip-
signal from other
er to "look at" and
esent in the count-
price are indicated

for applications where a buffer is needed apart from any of the specific output options shown, since the buffer function (and price) are already absorbed in many of the specific options, e.g., card punching. The storage buffer is offered in either the high speed, solid state form, or as a relay bank with contact closures well-adapted to making and breaking inductive loads.

THUMBWHEEL DATA SOURCE . . .

allows auxiliary data or parameters to be selected manually and transmitted with counter data to output devices. Thumbwheel digit switches are mounted on the front panel — up to 20 may be accommodated on a standard dual-axis panel. All output options indicated for the counter data also apply for this feature.

INTEGRAL READOUT DISPLAY . . .

is comprised of a horizontal row of lighted nixie-type digits. A glass filter is provided for ease of viewing. A compact and economical arrangement, the display is well suited for most applications. Digits are ⅝" high.

PROJECTION DISPLAY . . .

provides remote readout of large easy to read digits, using incandescent projection techniques. Projection allows digits to be in one plane, permits wide viewing angles, and is frequently requested for military application. A special power supply is required.

RANGE DETECTION . . .

allows the counter to provide visual display or electrical signals indicating that the counter contents, at any given time, are either equal to, less than, or greater than a preset number. Alternately, the actual difference from the preset number may be read out. Two preset numbers may also be set to mark the limits of a range and to indicate that the counter contents are in range, above range, or below range. The preset number(s) may be controlled with thumbwheel digit switches or introduced electrically from other equipment, e.g., in servo applications. (Refer to discussion of Reference Number Input Interface.)

ERROR DETECTOR . . .

provides a warning light or audible alarm when errors are introduced in incremental position readout applications, e.g., when counting rate has been exceeded. The feature is dependent on a periodic reference pulse which provides the basis for comparison. The reference pulse option would periodically correct any accumulated errors without the detector, but the latter offers the additional advantage of warning that the data recorded immediately prior to a reference pulse may have been in error.

GENERAL OUTPUT CAPABILITY . . .

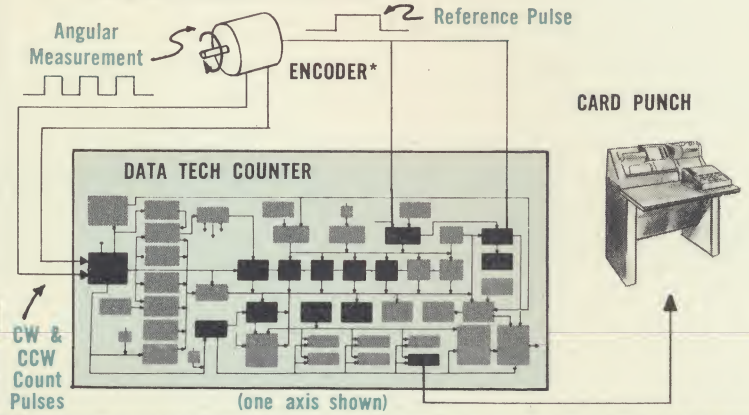
allows counter data to be transmitted in almost any desired format or coding. This may include serial, parallel, or any combination of bits or decades grouped as part of a scanning sequence with the interjection of algebraic signs, identification code letters, decimal points, etc. Coding may be 10 line/decade, 1-2-4-8 BCD, 1-2-2-4 BCD, or as desired.

The output drive interface (shown adjacent) allows for signal shaping of the counter output or of special command signals originating in the range detect, error detect, or general timing functions.

For a more complete discussion of output capabilities write for the descriptive bulletin, "Guidelines to Interfacing Capability".

POSITION MEASUREMENT

An Instrument Providing Visual Display, Periodic Referencing, Self-Check and Interface to Card Punch



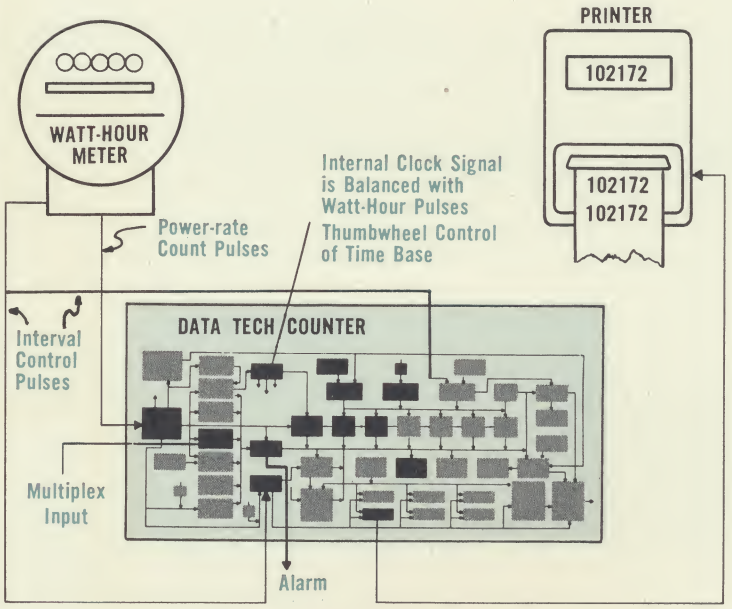
The diagram shows a bi-directional counter used as a readout means for a transducer which measures shaft angle. The shaft encoder* is incremental, supplying a series of pulses, each corresponding to a discrete increment of shaft angle. Clockwise and counter-clockwise pulses, supplied on separate lines, are used respectively to increment and decrement the counter. The counter thereby registers accumulated position change in either direction of shaft rotation. The encoder supplies a reference pulse once per turn to reset the counter to zero (or other initial condition), thereby affording initial orientation and periodic incremental error correction. An error detection circuit also uses the reference pulse, sounding an alarm in the event the counter is not already reading within a specified tolerance of the referenced position immediately prior to any reset. This feature becomes operative on the reset pulse immediately following the recording of data. The Modulo Reset option is incorporated to allow the angle to increment to 359.99° and reset to 0°.

In addition to accumulating and displaying the position answer, the illustrated system also provides output to an IBM 526 Card Punch. The output interface includes means for punching out the contents of thumbwheel switches mounted on the counter . . . useful for auxiliary data or parameters.

DATA TECH counters are readily adaptable as readouts for all types of incremental position encoders. Dual-axis counters are well suited as readouts for X-Y or R-Θ coordinate digitizing.

RATE MONITORING

Featuring: Adjustable Reference Rate Clock, Interval Demand-Limit Comparison, and Presettable Alarm Tolerance on Instantaneous Rate



In this application a bi-directional counter is used to monitor the rate at which electrical energy is consumed in a process industry. The actual rate is compared with a preset ideal rate over definite time intervals. The required information is: (a) the cumulative deviation from ideal consumption at the end of each interval; and (b) a warning indication whenever the instantaneous rate exceeds the ideal rate by more than a preset allowable margin. An operator monitors the counter and uses the foregoing information to manually adjust power rate controls as required.

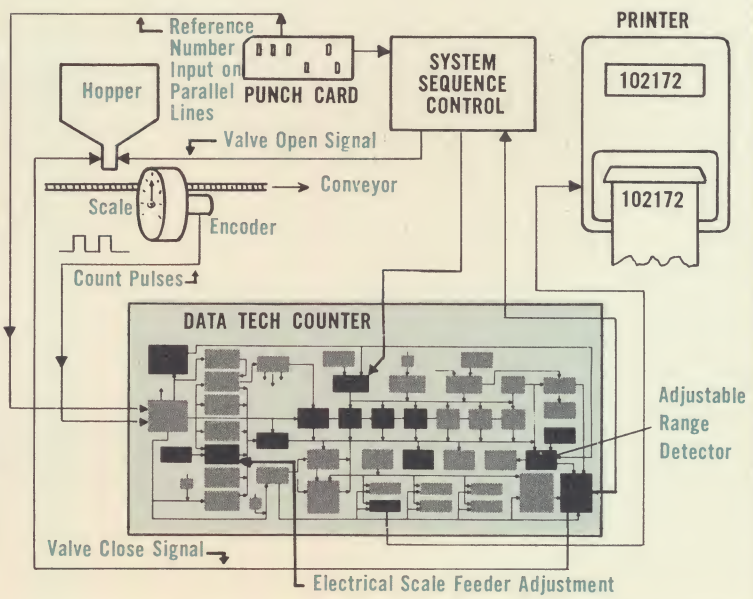
The energy rate to be measured is supplied in the form of pulses from a watt-hour meter. The ideal rate is supplied by an internal clock with the rate controllable by thumbswitches. The Multiplex option in this counter allows the two signals to be mixed and balanced against each other . . . the watt-hour pulses causing the counter to increment while standard rate pulses are causing the counter to decrement. Maintenance of the desired energy rate will thereby result in a null condition.

The watt-hour meter also supplies pulses which mark the beginning and end of each measuring interval. At the start of an interval the *interval pulse* presets the counter to a negative number selected by thumbswitches. The energy rate is adjusted by the operator so that it slightly exceeds the ideal rate causing the counter to proceed from the preset number slowly up toward zero. The next *interval pulse* terminates this interval and begins a new interval by again setting the counter to the preset number. This pulse also initiates a readout cycle whereby the number in the counter at the end of the interval is printed out on a paper tape printer. An alarm is activated whenever the counter is driven into its positive number range . . . thereby providing a prompt warning whenever the instantaneous rate has too much exceeded the desired rate. From this it may be seen that the preset number set on the thumbwheel switches represents the tolerance for the instantaneous rate.

DATA TECH counters are readily adapted for a variety of other rate measuring applications including frequency period and velocity measurements. The interval/frequency gating option with adjustable display time is often useful in such applications.

PROCESS CONTROL

A Closed Loop System for Automatically Weighing A Series of Ingredients According to A Preprogrammed Schedule



In this application a counter is used as part of a closed loop control system. The diagram shows a scale for weighing batches of ingredients measured out from a hopper.

The operation begins when the counter is preset to a number corresponding to a desired weight. This number originates from a punch-card reader and enters the counter in a parallel ten line/decade code. The feed valve is then opened electrically. As ingredient accumulates on the scale, the scale encoder supplies pulses causing the counter to count down from the preset number toward zero. The arrangement is such that a weight equal to the preprogrammed weight will cause the counter to reach a null condition. The Range Detect option is employed in this counter so that a series of control signals is generated as the counter approaches zero. Thumbswitches are used to determine a coarse or fine range. As the counter enters the coarse range a control signal is generated causing the feed rate to slow down. As the counter subsequently enters the fine range a second control signal completely closes the feed valve. Allowance is now made for any ingredient remaining in the chute to trickle down. When the input has ceased to increment a third signal is generated, initiating printout of the number remaining in the counter and causing the system to begin a new weighing cycle.

The mechanical scale factor of the weighing apparatus may be changed to suit the material being weighed. The counter compensates for this mechanical adjustment using electrical scaling of the input adjustable by thumbswitches on the counter.

The punch-card input is particularly useful in the above applications because it affords a means for sequencing various weights without requiring the attention of an operator. Multiple hoppers and valves could be provided for measuring out multiple ingredients on the scale. This arrangement would lend itself to automated mixing of ingredients since the system could be programmed to measure out X pounds of ingredient A, Y pounds of ingredient B, etc.

DATA TECH counters are readily adaptable to a variety of automated process control systems because of the wide scope of timing and interface options available.

*DATA TECH also offers a full line of both incremental and absolute encoders.

LOGIC IMPLEMENTATION

DATA TECH offers three basic card series for implementing logic as illustrated below. One will afford the best combination of desired features for your application. The following discussion highlights some of the key parameters affecting the choice.

☐ *SPEED* — should be evaluated in terms of the maximum counting rate, counting reversal rates, and whether or not data must be sampled from the counter during high-speed operation. Where all these factors are critical, the 500 Series or Integrated Series may be indicated. For simpler requirements up to 500 KC, a 100 Series counter may be specified with a high-speed modification of the least significant decade.

☐ *RELIABILITY* — is enhanced in all card series with all-silicon circuitry and conservatively rated components. The highest levels of noise immunity are achieved in the 100 Series cards where the design is not determined by a high-speed requirement. The highest overall reliability ratings plus relatively high noise immunity are provided through low impedance DTL circuitry in the Integrated Circuit Series.

☐ *LOGIC DENSITY* — can be maximized with the new series of integrated circuit cards. The 100 Series also offers greater density than the 500 cards.

☐ *STANDARDIZATION* — may be important when it is desired to limit the variety of logic card types . . . as for spare parts provisioning. This advantage should be offset against the cost and space savings which may result from using specialized card types. The 100 Series cards use a 22 pin connector and are built around specialized functions. Such specialization, also characteristic of the Integrated Series, minimizes the number of pin connections required. Logic functions are often internally connected on the card and not brought out for external use. Redundant or leftover circuitry is minimized or completely eliminated.

The 500 Series cards, on the other hand, use a 35 pin connector and offer the advantages of standardization. In addition to affording specialized card types, a number of basic logical elements, e.g. gates, flip-flops, one-shots are grouped on a card with all inputs and outputs brought to pin connections rather than internally connected. Since specialized wiring is then limited to the card racks, a substantially smaller number of card types is needed for any given system.

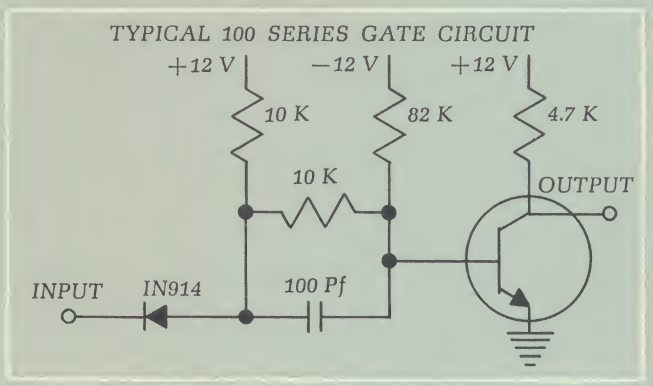
☐ *COST OF INTERFACE* — may be significantly affected by the choice of logic series. The important criteria are existing logic levels and the proportion which interface logic will bear to total logic. The 100 and 500 Series use 12 volt levels, more often compatible with existing equipment levels, and may therefore offer cost advantages where interfacing is a major consideration. The Integrated Series, with 3 to 4 volt levels, will typically increase such costs except where existing equipment uses integrated circuits.

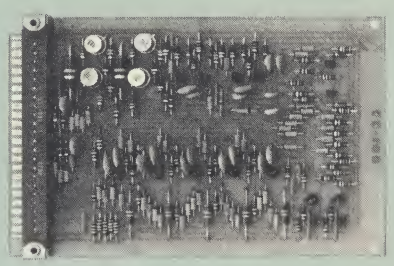
☐ *OVERALL ECONOMY* — is best achieved with the 100 Series cards where speed is not the major consideration. Cost advantages in this series derive mainly from the specialization of logic functions and related reductions in system wiring and connector costs.

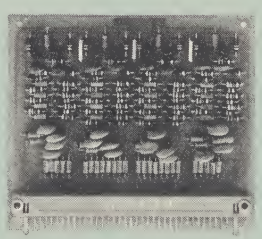
GENERAL CHARACTERISTICS — ALL CARD SERIES

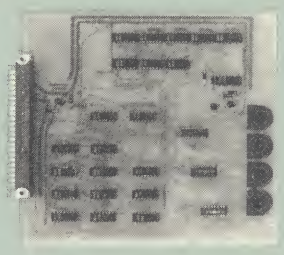
☐ All-Silicon Solid State Circuitry. ☐ All Inputs and Outputs Compatible With Other Cards in the Same Series. ☐ All DC Inputs Are Diode Coupled to Draw Current at Ground Level and float at the Positive Level. ☐ All Standard Outputs Use Common Emmiter NPN Configuration for Current Drive Capability at the Ground Level. ☐ Typical 2 Volt Noise Rejection on all AC Inputs. ☐ Standard Gates, Flip-Flops, and One-Shots Afford Drive Capabilities Ranging from 4 to 7 Times Their Input Loading. Special Gates Afford Higher Fanouts as Desired. ☐ Flip-Flop Outputs Diode Back-Biased to Provide 6 Volts Noise Rejection on Output Lines.

TYPICAL 100 SERIES GATE CIRCUIT









COMPARATIVE ADVANTAGES OF 3 CARD SERIES

100 Series

- ☐ Lowest Cost
- ☐ Maximum Noise Rejection
- ☐ Ease of Interface
- ☐ Lowest Power Consumption
- ☐ High Logic Density

500 Series

- ☐ High Speed (to 1 MC)
- ☐ Ease of Interface
- ☐ Minimum Number of Card Types Required

Integrated Series

- ☐ Maximum Speed (to 2.5 MC)
- ☐ Maximum Logic Density
- ☐ Maximum Reliability
- ☐ High Noise Rejection

HOW TO ORDER A DATA TECH COUNTER

(1) Use main foldout chart to determine desired features and options as well as the total number of logic cards required to implement. Multiply card requirements by the number of axes required.

(2) Use section on Logic Implementation to determine the type of logic best suited to requirements for speed, reliability, density, spare parts provisioning, and economy.

(3) Select one of six standard cabinets which will be adequate to house the required number of cards and provide panel space for displays and controls.

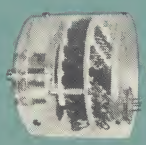
(4) Specify input/output signal shaping requirements.

(5) Summarize foregoing information on the convenient reply form. DATA TECH will be pleased to quote based on this information, or to have an application engineer contact you as needed.

NOTE: An approximation of total counter price may be obtained by totalling option prices, counter stage prices, the cabinet price, and adding $120 to $240 for power supply depending on number and type of cards. Option and stage prices must be multiplied by number of axes required.

OTHER DATA TECH BUILDING BLOCKS

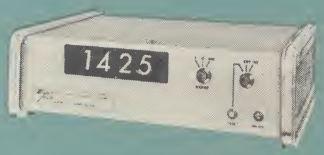
VERNISYN



INCROSYN

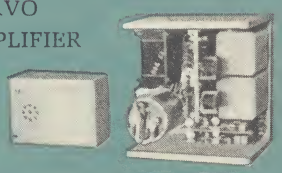
PHOTOSYN

RACK & PINION MECHANISM

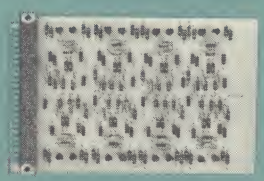


VOLTAGE DIGITIZER

SERVO AMPLIFIER

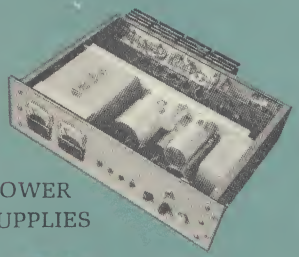


SOLID STATE FREQUENCY CONVERTER



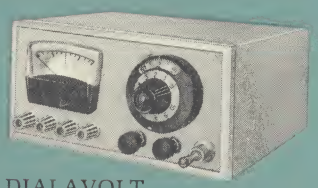
LOGIC CIRCUIT CARDS

ROTOTRAN



POWER SUPPLIES

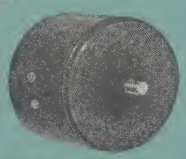
CUSTOM DISCS



DIALAVOLT

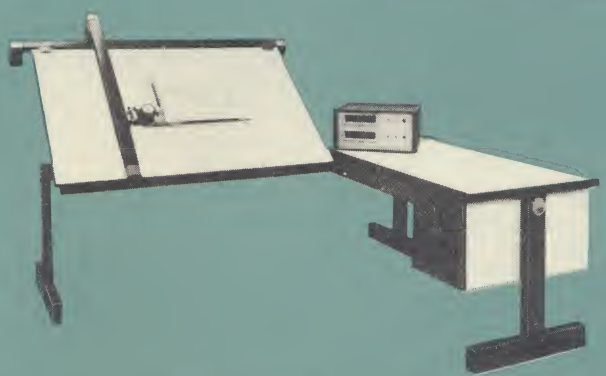
RPMETER

PULSER

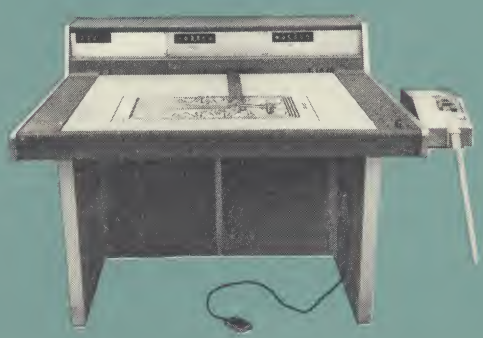


MEMORY KEYBOARD

DATA TECHNOLOGY SYSTEMS



DIGITIZED DRAFTING TABLE



COORDINATE DIGITIZING TABLE

ACTION REQUEST FORM

☐ PLEASE QUOTE PRICE FOR COUNTER WITH THE FOLLOWING OPTIONS:
OR ☐ Have your Sales Engineer call. My requirements are indicated in 4 and 5.

CHECK ALL THAT APPLY

1. ■ *INPUT SIGNAL SHAPING*
   ☐ Gate ☐ Level Change ☐ One Shot
   ☐ Schmitt Trigger ☐ Differential
   ☐ Other_____
   ■ INPUT PROCESSING
   ☐ External Reference Number
   ☐ External Clock ☐ Interval / Frequency Gating
   ☐ Direction Logic ☐ Multiplex
   ☐ Scaling ☐ Manual Increment
   ■ INTERNAL FUNCTIONS
   ☐ 50 KC ☐ 500 KC ☐ 1 MC
   ☐ Unidirectional ☐ Bidirectional
   ☐ Plus-Minus ☐ Time Base
   ☐ Modulo Reset_____
   ■ RESETS AND PRESETS
   ☐ Variable Preset ☐ Zero Reset
   ☐ Reference Reset ☐ Other_____
   ■ CONTROL DISPLAY
   ☐ Thumbwheel Controls (indicate type) _____, _____
   ☐ Range Display ☐ Nixie
   ☐ Projection Display ☐ Push Buttons
   ☐ Thumbwheel Data Source
   ■ OUTPUT PROCESSING
   ☐ High-Speed Slew Transfer
   ☐ Slew Transfer to Relays
   ☐ Solid State Buffer ☐ Relay Buffer
   ☐ Other_____
   ■ DETECTION/MONITORING
   ☐ Error ☐ Alarm ☐ Range
   ☐ Other_____
   ■ OUTPUT FORMATS
   ☐ Tape Punch ☐ Printer
   ☐ Teletype ☐ Computer
   ☐ Magnetic Tape ☐ Card Punch
   ☐ BCD ☐ 10 Line ☐ Serial
   ☐ Other_____
   ■ OUTPUT DRIVING
   ☐ Gate ☐ Level Change
   ☐ Power Driver ☐ Relay Closure
   ☐ Other_____
2. *LOGIC CARD SERIES PREFERRED*
   ☐ 100 Series ☐ 500 Series ☐ IC
3. *STANDARD CABINET PREFERRED*
   Type ☐ 51 ☐ 52 ☐ 53 ☐ 81
   ☐ 82 ☐ 83 ☐ Nema ☐ Other_____
4. *COUNTER CAPACITY:*
   No. of Axes:_____;
   No. of Decades/Axis:_____
5. *OTHER REQUIREMENTS:*
   _____
   _____
   _____
   _____
6. *PLEASE DETAIL:*
   Application:_____
   Environment:_____
   Input Source:_____
   Output Equipment:_____
7. *NUMBER OF UNITS REQUIRED*_____
8. *DELIVERY REQUIREMENTS*_____

Name_____
Title_____
Company_____
Address_____
City_____ State_____ Zip_____
Telephone Number_____

Please fold and staple before mailing.

FIRST CLASS
PERMIT NO. 36487
BOSTON, MASS.

BUSINESS REPLY MAIL

NO POSTAGE NECESSARY IF MAILED IN THE UNITED STATES

POSTAGE WILL BE PAID BY:

DATA TECHnology, inc.

65 GROVE STREET
WATERTOWN, MASS. 02172

ADDITIONAL PRODUCT INFORMATION AVAILABLE from DATA TECHnology

Systems

- ☐ Digitized Drafting Table
- ☐ Coordinate Digitizing Table
- ☐ Numerical Controls for Machine Tools
- ☐ General

Building Blocks

- ☐ *Encoders (Check All That Apply)*
  - ☐ Shaft
  - ☐ Linear
  - ☐ Incremental
  - ☐ Absolute
  - ☐ Magnetic
  - ☐ Optical
- ☐ *Electrical Converters and Instruments*
  - ☐ Rotary Transformers
  - ☐ A/D Converter
  - ☐ Dialavolt
  - ☐ RPMeter
  - ☐ Frequency Meter
  - ☐ Digital Voltmeter
  - ☐ DC Supplies
  - ☐ Frequency Converter
  - ☐ Servo Amplifier
- ☐ *Logic Circuit Cards*
- ☐ *Input-output interface*